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Preface

This document presents the abstracts of all presentations that built the **Annual Conference of LifeWatch Italy 2018**, with **6 plenary talks** and **5 oral sessions**, comprising **37 contributions.**

LifeWatch Italy is the national node of LifeWatch-ERIC, the European Infrastructure supplying e-Science research facilities for biodiversity and ecosystems. LifeWatch was born to allow researchers tackling today's big challenges, such as those related to the sustainability of development, conservation of biodiversity and ecosystems, and climate change, by using virtual research environments equipped with cutting-edge ICT tools to share, manage and model data.

The Annual Conference of LifeWatch Italy 2018 took place in Rome, from June 25th to 27th, and was open to the national scientific community, presenting the latest developments of the national node, welcoming also external contributions on case studies and technological solutions, creating new opportunities for interaction and cooperation with the Infrastructure.

The Scientific Conference (June 25th and 26th) was held in the Department of Environmental Biology of the University of Rome - La Sapienza. It was articulated in plenary and parallel thematic sessions addressing key topics at the heart of LifeWatch Italy activities in the last two years, focusing on "Data & Metadata", "ICT Services & Semantic Resources" and "Citizen Science, Communication of Science & Education".

In the session "Data & Metadata", experiences, models and case studies on the use of data and metadata in the study of ecosystems and biodiversity were gathered. Actually, it is increasingly demanded to host data resources in public accessible archives ensuring transparency, reproducibility and sustainability of scientific research and its results. It is of great importance that in this process, data are described in a rigorous manner, completed by metadata, essential to deeply understand data and make them accessible, interpretable and reusable over time. In the three parallel sessions dedicated to the "ICT Services & Semantic Resources", researchers brought the experience of a number of projects and infrastructures in the development of web services and Virtual Research Environments for the study of biodiversity and ecosystems and in the implementation of semantic resources, such as controlled vocabularies and ontologies, to support interoperability among different data infrastructures. Finally, in the session dedicated to "Citizen Science, Communication of Science & Education" ICT tools and resources to collect and analyse citizens' observations, as well as the possibility to access training programs were presented. Presentations focused both on the development of web services, applications and ICT platforms to facilitate citizens' involvement, from data collection to result analysis and of learning environments and gaming resources, essential to provide students the key competences to understand the context surrounding them.

The Institutional Day, closing the Conference (June 27th) was organised in collaboration with the Secretariat General of the Presidency of the Italian Republic and hosted by the Castelporziano Presidential Estate, featuring a conference followed by a round table. The conference presented LifeWatch Italy to national stakeholders and showed how the competences held by LifeWatch can trigger a virtuous cycle capable of

concretely impacting, not only on the conservation of biodiversity and ecosystems, but also on aspects with high social relevance, such as employment and sustainable development, energy supply, nutrition and agriculture. The round table concluded the working session enabling an exchange among representatives of research infrastructures (such as MIRRi, Danubius, LTER, AnaEE, ICOS, EMSO) active in the field of life sciences, contributing to the debate on a coordination strategy to strengthen the competitiveness of the national research on biodiversity and ecosystems, and its synergies with the socio-economic components.

Abstracts for oral presentations are sorted first by presentation day and then by presentation time.
Abstracts for posters are sorted by session and then by presentation time.
Presenter name is in bold-face type.
Some abstracts in this collection are not edited and are printed in the condition they were received.

Scientific Committee

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Plenary Talks

PT1 - Alberto Basset: The HUB of LifeWatch Italy for data resources on biodiversity and ecosystems

PT2 - Fabio Attorre: The thematic node on plant biodiversity

PT3 - Nicola Fiore: Semantics for research on biodiversity and ecosystems

PT4 - Palma Blonda: A Community Modeling Platform

PT5 - Stefano Martellos: A Citizen Science Platform

PT6 - Antonello Provenzale: Protecting Natural Ecosystems: from Earth Observation to Virtual Museums

Session Data & Metadata
Oral Presentations

Long-term data on the demersal faunal assemblages in the Central Mediterranean

Maiorano P.[1], Capezzuto F.[1], Carlucci R.[1], Ciardo L.[2], D'Onghia G.[1], Sion L.[1], Tursi A.[1]

Data on the demersal megafauna collected in the last 30 years in the context of national and international projects on the assessment of the demersal resources of the Ionian Sea (Central Mediterranean) has been stored in a common data-base hosted in the Biology Department of University of Bari (Italy). The technology platform FISHWARE ïƒ£ using a RDBMS Oracle has been created in order to produce a MiddleWare for data coming from different projects conducted over a long-time period. A large amount of data derives from experimental bottom trawl surveys carried out in the Ionian basin between 10 and 800 m in depth with the same sampling design from 1985 to 2016. Additional data has been collected during other projects performed in small areas of the Ionian Sea along different years down to 4000 m in depth. Geo-referenced information at species level on occurrence, abundance and distribution of sampled fishes, crustaceans and cephalopods have been stored in this repository together with data on length, weight, sex and maturity stage detected at individual level from most of them.

The availability of such historical data, represents a powerful opportunity to detect potential changes over time in the Ionian faunal assemblages in term of species diversity, distribution and abundance but also to analyse over a long-time period the life-history traits at populations level. This knowledge may be also useful to assess the response of the demersal communities to natural and anthropogenic pressures also acting in the recent years at both local Ionian and Mediterranean scale.

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[2] Laboratories of the Foundation of the Trend Holding Development

Macrobenthic variability in streams and rivers of Northern Italy

Gaglio M., **Muresan A. N.**, Castaldelli G., Fano E. A.

River ecology conceptualized different theories to describe the responses of benthic riverine communities to environmental variability. The River Continuum Concept (RCC) (Vannote et al 1980) suggests that river communities are adapted to optimize their energy balances according to physical gradients from headwater to mouth. On other hand, the Riverine Ecosystem Synthesis (RES) (Thorp et al 2006) introduced the relevance of lateral dimension and local ecological patterns across various temporal and smaller spatial scales.

This work analyses the macrobenthic communities sampled in 61 sites from 16 rivers of Northern Italy in order to investigate which theory (RCC or RES) better describes their variability. A total of 12 physical, chemical and ecological parameters were considered to describe both longitudinal and lateral dimensions, as well as local variability.

The observed macrobenthic communities were composed by a total of 69 families. Statistical analysis describes the relevant effects of different environmental parameters.

The findings are discussed under the lens of the different theories which are debated in the river ecology.

Dpt of Life Sciences and Botechnologies, University of Ferrara

The inconvenient truth on the fish fauna of Italian lowland waters

Castaldelli G.[1], Milardi M.[1], Lanzoni M.[1], Aschonitis V.[2], Gavioli A.[1], Fano E. A.[1]

Globally, freshwater ecosystems are subjected to severe and continuous loss of fish species. The scientific debate on the causes of this phenomenon, whether biotic or abiotic, is still open.

In the Po Valley, north Italy, the decline of native fish fauna is particularly serious and seems to have been determined both by the degradation of habitats and by the introduction of exotic fish species. In support of this hypothesis we present here the results of a series of studies, published on data from the fish inventories of Emilia-Romagna Region and other long-term data series on the Po River.

The results show a general impoverishment of the native fauna in all the altitudinal zones but with the most serious evidences in the lower stretches of the rivers and in the canals. There, the exotic species have brought most of the native species to local extinction, pushing the scarce residual populations to the margins of their natural distribution, that is, the waters of the foothills. In some sites of the north-eastern part of the region it has been highlighted the complete substitution of native species with exotic species, which now constitute exotic communities capable of self-regulation.

In these hotspots of xenodiversity and, more generally, in all considered sites on the plain, exotic species of cyprinids have contributed to the change of habitat, favoring the decline of aquatic vegetation and increasing the turbidity of the waters. This feedback concerning the quality of water, together with the operational impossibility of exerting an effective control, opens the discussion on what strategy to adopt for the implementation of the community directives for the conservation of biodiversity and for the achievement of the objectives set by the WFD.

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[2]Hellenic Agricultural Organization – Demeter Thessaloniki

The new Checklist of the Italian fauna

Bologna M. A., Boero F., Bonato L., Casale A., Curini Galletti M., Massa B., Minelli A., Oliverio M., Vigna Taglianti A., Zapparoli M.

The animal diversity of Italy is the richest in Europe. The Scientific Committee for the Italian Fauna (CSFI), since its foundation (1952) is aimed at publishing monographic volumes on the diversity, taxonomy, faunistics and ecology of animal taxa in Italy. A total of 52 volumes on different groups of invertebrates and vertebrates have been so far published.
In the period 1992-1995 CSFI has dealt with the huge task of publishing a commented checklist of the species of Italy, the first complete inventory of animals of a large European country. The Checklist included 57.422 species of Protozoa and Metazoa, with information on their distribution in the four macro-regions of Italy: continental, peninsular, Sardinia and Sicily for terrestrial and freshwater species, and three macro areas (western basins, upper and middle Adriatic, Ionian basin) for the marine species. During the last 25 years several taxonomic changes concerned the Italian species (synonymies, splitting, binomial arrangements, etc.), many new species have been described from our country, and numerous species have been discovered as well, in our terrestrial and marine areas. At present, we estimate that c. 61.000 animal species may occur in Italy.
The recent participation of CSFI to the European infrastructure LifeWatch, is thus a relevant occasion to design and develop of a new Checklist of the Italian Fauna. The new Checklist will be online only and organized with a totally different architecture than the previous one.
The new project will be framed at three distinct levels of complexity, associated to different databases: (i) one database with the updated taxonomic list of Protozoa and Metazoa, as result of the work of an international panel of about 300 specialists of the different taxa. All published taxonomic changes and new species will be included. (ii) One database of the distribution of the species in the 20 administrative Italian regions, in the adjacent areas which are zoogeographically Italian (depts. of Corse and Nice, Principauté de Monaco, Canton Ticino, Istria, Repubblica di San Marino, Stato della Città del Vaticano, Republic of Malta), and in the 9 marine biogeographic regions. (iii) One database implemented by faunistic and ecological data of the 61.000 Italian species, gathered from the scientific literature or available from public and private collections. The latter database, which will include more than one million of records, will be associate to an additional database with the PDFs of the scientific papers in which such data have been published.

Scientific Committee for the Italian Fauna

bARKoding - bioinformatics data to improve environmental quality and human health of an endangered insular system: the case of Magoodhoo Island-Maldives

Galli P.[1, 6, 7], Labra M.[2], Casiraghi M.[2], Montano S.[1, 6], Seveso D.[1, 6], **Maggioni D.[1, 6]**, Malatesta S.[3,6], Schmidt M.[3,6], dell'Agnese E.[4,6], Savini A.[1, 6], Strepparava M. G.[5,6]

The Maldives are presented as one of the symbols of the urgency of Small States' adaptation to Climate Change. General goal of the project is to set up a new strategy to prevent biodiversity erosion and improve territorial planification and human wellness. At the technical level the goals are:
-Set up a DNA barcoding and metabarcoding approach to estimate whole biodiversity at the isolated and endangered areas.
- Design new bioinformatics tools shared with the Life Watch platform to integrate molecular data with other sources of information such as ecological interactions, climatic conditions, chemical features
- Define a machine learning system to predict the effect of abiotic and biotic stress on biodiversity and to define suitable resilient strategies.

Project phases

Data acquisition and computerization

Where, how and why

- Programming and development of new computer programs for big data management. connection to infrastructure
- Prediction strategies and resilience actions

The project will be conducted through the use of the DNA barcoding strategy, in 2 islands located in Maldives 1) Magoodhoo Island: inhabited by the local population, 2) Adanga: uninhabited island.

Main research products

The main research products are:
1) Achievement of the first completely DNA barcoded island in the world
2) realization of the first dataset of species characterized from the functional point of view and from the point of view of the relations of the functions correlated with the human activities
3) realization of a dataset that can be used to study specific microbiomes.

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[4] Dpt. of Sociology and Social Research, University of Milan-Bicocca
[5] Dpt. of Medicine and Surgery, University of Milan-Bicocca
[6] MaRHE Center (Marine Research and High Education Center), Magoodhoo Island Faafu Atoll, Republic of Maldives
[7] LifeWatch Italy

Long term biodiversity studies foster Virtual Research Environments: the case of the Tarquinia salterns

Cimmaruta R., Nascetti G.

Ecology is rapidly evolving in a data-intensive science, to better answer growing questions concerning biodiversity loss and its possible consequences. Virtual Research Environments (VRE) are powerful tools allowing the integration and computational synthesis of different datasets to address biodiversity and ecosystem management, but require both a substantial computational capability and large data collections availability.

Long-term ecological studies (LTEs) are a valuable source of data to foster VRE, since they are widely acknowledged as essential in our understanding of both natural and anthropogenic driven changes of the environment. They may therefore benefit of workflows supporting large scale analysis.

The Tarquinia Salterns represent an example of how a LTE may provide data to the e-Biodiversity Research Institute of LifeWatch. This protected area located on the Tyrrhenian coasts of central Italy has been subjected to temporal oscillations of the environmental quality since 1997, due to the alternation of disregard, restoration and management activities. Being a protected coastal area of high relevance for migratory birds, the salterns have been monitored during the last 20 years to study how the biodiversity responded to such changes, producing data on the genetic, species and community levels. LTE data are therefore available concerning the environmental quality (physical-chemical parameters) and all levels of biodiversity organization: genetic variation of resident populations (target: killifish), species abundance (target: waterbirds) and community complexity (target: benthic community).

This kind of data may well contribute to build up the backbone to address questions on coastal wetlands vulnerability to environmental perturbations, including climate change.

Dpt. of Ecological and Biological Sciences, University of Tuscia

Session Data & Metadata
Poster Presentations

Using of RanVegDunes, a random plot-database of Italian coastal dunes

Sperandii M. G.[1], Prisco I.[1], Stanisci A.[2], Acosta A. T. R.[1]

As global changes and anthropogenic pressures are severely transforming both composition and diversity of ecosystems across the globe, quantifying such alteration and identifying main trends are crucial tasks in the protection and management of natural systems.
In this light, collecting and storing vegetation data is crucial to keep track of changes and monitor the conservation status of ecosystems through time, especially in case of endangered habitats such as coastal dunes.
While introducing RanVegDunes, the first Italian database collecting standardized, randomly-sampled vegetation data in coastal dune environments, we show some of its applications.
At present, RanVegDunes consists of 1169 original relevés performed between 2002 and 2017 along Holocenic dune systems of five Italian administrative regions (Lazio, Campania, Abruzzo, Molise and Puglia), but data acquisition is ongoing. In these areas, 4m² plots were used to sample vegetation across the entire coastal zonation, ranging from annual pioneer communities of the upper beach up to wooded dunes and Mediterranean forests, therefore including 9 EU Annex I Habitats (1210, 2110 ,2120, 2210, 2230, 2250, 2260, 2270, 9340) and 5 corresponding level 3-EUNIS Habitats (B1.1, B1.3, B1.4, B1.6, B1.7). Along to a list of recorded vascular plants, each plot contains estimates of species abundances recorded on a percentage cover scale.
The strength of RanVegDunes lies in the quality of its data. All plots are random, standard in their size and georeferenced using a highly-accurate GPS unit, which means they can be reliably retrieved and resampled.
Currently, RanVegDunes is being used as a baseline for a resurveying study involving the resampling of coastal dune plots after 10-15 years. In this context, the availability of historical data allowed to highlight those habitats which in this time-span experienced the most important changes. However, this database can also serve as a valuable tool for addressing topics related to ecological modeling or to the analysis of spatio-temporal patterns of invasion.

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The first standardized and accessible database describing mediterranean high-elevation vegetation in Italy: "VIOLA"

Stanisci A.[1], **Carranza M.L.[1]**, Calabrese V.[1], Evangelista A.[1], Stinca A.[2]

VIOLA (Vegetation of central Apennines) is a database that, collecting high mountain vegetation plots in the Central Apennines (Italy), is the first standardized and accessible database describing Mediterranean high-elevation vegetation in Italy.

VIOLA gathers a representative number of relevés from 7 Annex I habitats sensu Habitat Directive (92/43/EEC) (4060, 4070*, 6170, 6210, 6230*, 8120 and 8210). It contains 1,761 relevés collected in the last six decades all localized in the central Apennines (Gran Sasso, Majella, Monti del Matese, Monti della Meta and Velino massifs). The oldest relevés back to 1955, whereas the newest ones to 2017. Most of the relevés (77.8%) are between 10 and 100 m2 wide. The Alpine and subalpine calcareous grasslands (6170) and the Calcareous and calcshist screes (8120), with over 50% and almost 20% of the relevés, respectively, are the most represented Annex I EU habitats in the database.

The information contained in VIOLA offers an excellent overview of the diversity of Mediterranean high-mountain habitats in the Central Apennines and, therefore, can be a valuable tool for nature conservation issues and for ecological monitoring, and research programs aimed at improving our knowledge about the potential impacts of global change (i.e., land-use change and climate change) and for identifying efficient conservation strategies for high mountain ecosystems. In addition, it can serve to identify hot spots of biodiversity and/or to identify less explored areas, thus guiding management strategies and monitoring site distribution.

[1] EnviX-Lab Dpt. of Biosciences and Territory (DiBT), University of Molise
[2] Dpt. di Environmental, Biological and Farmaceutical Sciences and Technologies, University of Campania Luigi Vanvitelli

Changes of functional attributes in benthic communities of a Mediterranean pond system along a salinity gradient

Muresan A.N., Gaglio M., Nobili G., Castaldelli G., Fano E. A.

Despite their peculiarity, the ecology of permanent pond systems is poorly investigated in literature. These ecosystems are threatened by different forms of environmental change, including groundwater salinization and water withdrawal. The response of living communities to these changes are still unclear.

This study aims to investigate the response of macrobenthic communities along a salinity gradient in a coastal permanent pond system located in Bosco Mesola (Northern Italy). The area was subjected to groundwater salt intrusion during last decade.

Functional diversity was investigated by means of seven functional traits (feeding, mobility, adult life habitat, body size, life span, reproductive frequency and habitat choice). Statistical analysis was performed to identify the main environmental factor controlling taxonomic and functional diversity, and to test differences in functional traits.

Results highlight that ponds with higher salinity levels show communities with lower taxonomic diversity and simplified functional attributes. Macrobenthic communities switched from specialist to generalist taxa, and from predator, shredder and scraper species to deposit feeder-dominated communities.

The findings show that the environmental changes occurring in coastal systems are harming functional diversity of living communities.

Dpt. of Life Sciences and Biotechnologies, University of Ferrara

Session ICT Services & Semantic Resources

Oral Presentations

Biomolecular Thematic Centre: recent advances and future perspectives

Santamaria M.[1], **Balech B.[1]**, Fosso B.[1], Manzari C.[1], Marzano M. [1], Gissi C.[2], De Filippis T.[2], Zingone A.[3], Pesole G.[1,2]

In the framework of LifeWatch Italy and in collaboration with other European Infrastructures such as ELIXIR and EMBRC, the research group involved in the Biomolecular Thematic Centre with the associated Laboratory (MoBiLab) has accomplished a number of actions and developed innovative tools and databases useful for molecular biodiversity monitoring and analyses. In the last year the upgrade of two bioinformatic tools and one biomolecular database, namely MSA-PAD, BioMaS and ITSoneDB, has been finalized. MSA-PAD is a multiple DNA aligner aimed at supporting evolutionary analyses through phylogeny inference. BioMaS is a taxonomic assignment pipeline able to classify High-Throughput Sequencing meta-barcoding data. ITSoneDB is a curated database of Eukaryotic ribosomal Internal Transcribed Spacer-1 (ITS1) sequences, appealing to use as reference to analyze meta-barcoding data. Currently, the MoBiLab team is developing new data retrieval and quality control tools for the animals' DNA barcode marker Cytochrome Oxidase sub-unit I (COXI) gene as well as for the chloroplast molecular markers rbcL, matK and trnH-psbA known as suitable DNA markers in plants. These tools will be released and published shortly and will be integrated in the LifeWatch infrastructure. All projects proposed to the call launched by LifeWatch Italy and supported by MoBiLab, focused on alien or invasive species, have been completed and the relevant results published in several cases in high-profile journals. Finally, the Biomolecular Thematic Centre team has been in charge in the organization of the 4th workshop focusing on the Species interaction's EBV class in the framework of the Globis B Project.

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The key role of semantics for data integration and interoperability in biodiversity and ecosystems research

Bergami C.[1,2], Balech B [1,3], Boggero A.[1,4], Cianferoni F.[1,5], Colangelo P.[1,5], De Felici S.[1,5], Fiore N.[1,6], Oggioni A.[1,7], Pierri C.[1,5], Roselli L.[8], Stanca E.[6], Tagliolato P.[1,7], Rosati I.[1,5]

Biodiversity and ecosystem research deals with heterogeneous and distributed data resources generated from a large number of disciplines, which need to be integrated to advance the actual scientific knowledge. There is a clear need for integrative research, but at the same time, it is very challenging to provide appropriate solutions for the management of information.

Within the biological and ecological informatics communities, recent efforts are devoted to the adoption of semantic web techniques, which provide a promising way to properly describe and interrelate different data sources to reduce barriers to data discovery and integration. In this respect, semantic harmonization, achieved with the development and use of thesauri, represents an essential precondition.

The E-Biodiversity Research Institute of LifeWatch Italy (LW-ITA) developed thesauri, available as a web service (http://www.servicecentrelifewatch.eu/catalogue-of-services), on morphological traits of several groups of aquatic organisms, on alien and endemic species, and on genomics and barcoding. They were all implemented in Simple Knowledge Organization System (SKOS) and Resource Description Framework (RDF), using TemaTres, an open-source web-based platform for the collaborative management of thesauri, as well as a Linked Data interface and an RDF query language (SPARQL) endpoint.

The development of LW-ITA thesauri is the result of an interdisciplinary collaboration of experts from both the specific domains and information and communication technologies. In this context, experts had a central role in the different phases of implementation of thesauri, resulting in the production of shared and stable versions of thesauri, and in the extension of the range of covered concepts.

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[4] CNR, Institute of Ecosystem Study (CNR-ISE)
[5] CNR, Institute of Agro-environmental and Forest Biology (CNR-IBAF)
[6] Dpt. of Biological and Environmental Sciences and Technologies, University of Salento
[7] CNR, Institute for Electromagnetic Sensing of the Environment (CNR-IREA)
[8] Environmental Protection Agency of Puglia Region, Dpt. of Lecce

A new Semantics based environment to support collaboration in tackling the emergent marine ecosystem diversity treat of the marine microplastics

Diviacco P.[1], Pavlov D.[2], Malfatti F.[1], Busato A.[1], Emelianov Y.[3], Mouromtsev D.[2], Del Negro P.[1]

Collaborative research needs common understanding. This can be obtained by means of an IT system that at the same time supports the creation, captures and makes available knowledge while it is built. In this perspective OGS, in collaboration with ITMO university, developed a web-based tool called COLLAONTO that aims to address this needs through the use of boundary objects based on web ontologies that can guide scientists in consolidating and accessing data, information and knowledge by mean of a graphic representation of a domain of knowledge.

We have tested the newly developed semantic space with the emergent treat of the marine microplastics. We have created a graph based on an ontology that represents the major pathways for the plastics to enter in the marine ecosystem and then becoming microplastics thus affecting marine life and diversity.

We will discuss how this semantic space has been developed and how we have created an alive interoperable working space for researchers to share, harmonize and capitalize existing knowledge on marine microplastics based on their personal -peer-curated- expertise. Our semantic space can evolve thus allowing the researcher to co-design the space to the growing needs of the field.

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[2] ITMO University, St. Petersburg, Russia
[3] VISmart Ltd., St. Petersburg, Russia

The LifeWatch-ITA Core Ontology and its application to the Phytoplankton domain

Fiore N.[1,2], Rosati I.[1,3], Stanca E.[1,2], Bergami C.[1,4], Oggioni A.[1,5], Tagliolato P.[1,5], Carrubba C.[1,2]

Biodiversity and ecosystems data are very heterogeneous and need to be better managed for improving the actual scientific knowledge. Semantic approaches provide a promising way to capture rich representations of data in ways that afford maximum interoperability and detailed description for re-use.
Here, we present the LifeWatch-ITA Ontology framework for capturing the process of ecological field observation and measurement, facilitating logic-based reasoning to be utilized to automate important data-management applications for data synthesis.
The LifeWatch-ITA Core Ontology is a customization of the OBOE core ontology and it is based on 7 main concepts (classes) such as Domain, Entity, Observation, Characteristic, Measurement, Protocol, Standard. It provides a structured yet generic approach for semantic data annotation and for developing domain-specific ecological ontologies such as the Phytoplankton Trait Ontology (PhyTO), used to test the effectiveness of the proposed approach.
In particular we implemented the Phytoplankton show case to demonstrate how the entire data lifecycle can be supported and automated using semantic resources. A first software module has been designed and developed to map metadata and Phytoplankton data stored in the LifeWatch Data Portal with the OWL schema of the PhyTO Ontology and to produce .rdf output files. These files are used by a second module be stored in a VIRTUOSO triple store, that makes them available for semantic searches. To give the opportunity also to non ICT-expert users to browse and search the data, a very user-friendly web interface has been developed. The web interface suggests to the final users a preconceived set of queries created by domain experts.

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[4]CNR, Institute of Marine Sciences (CNR-ISMAR)
[5]CNR, Institute for Electromagnetic Sensing of the Environment (CNR-IREA)

eXtreme DataCloud: flexible and high-level tools for Data Life Cycle management for the LifeWatch community

Donvito G., Antonacci M., Spinoso V., Nicotri S.

eXtreme DataCloud (XDC) is a H2020 EU founded project (EINFRA-21 call) started in November 2017, aiming at developing scalable technologies for federating storage resources and managing data in highly distributed computing environments.

We present the planned activities and the status of the implementation, focusing on new enhanced services and capabilities under development, which will allow researchers to manage metadata in a flexible way, also for very large datasets.

XDC will enable high-level data ingestion features, like the possibility for the user to specify tasks and workflows to be executed on data just after ingestion, before they are stored.

Smart caching mechanisms will be provided, to support the extension of a site to remote locations, so that data will always be remotely accessible, without the need of explicitly copying them to perform analyses.

The project will support many use cases, some of which deal with critical data. One important goal consists in providing encryption management services needed to store sensitive data in remote locations. Encryption will take place during ingestion and infrastructure services will provide “upload clients”to perform this action.

The LifeWatch community is deeply involved in the project and will support the “algae blooms” use case, focused on integrating large and heterogeneous data sources in order to perform multiple analyses with different models to obtain information like water availability, turbidity, chlorophyll concentration, etc. Within XDC, the whole process will be automatized using the tools described into this work.

National Insitute of Nuclear Physics

Novel services for plant sciences in the LifeWatch Infrastructure

Chiarucci A. [1], **Attorre F.[2]**, Martellos S.[3], Venanzoni R.[4]

Global electronic access to biodiversity information is a priority task within biological sciences since the Rio Conference (1992). Progresses in the field of Biodiversity Informatics have led to relevant results, such as the creation of global distributed networks for the aggregation of primary biodiversity data and of reliable repositories of taxon names. In order to contribute to global and European initiatives and elaborate appropriate management and conservation strategies, Italy needs to develop a structured and effective digital network infrastructure. LifeWacth has the responsibility to build such infrastructure, and provide tools and services to different stakeholders in order to mobilize and make easily accessible the huge quantity of information already available, but scattered among different institutions such as natural history museums, botanical gardens, universities etc. Within this framework we present the state of the art of the existing biodiversity informatics initiatives related to plant science in Italy, and discuss how LifeWatch can play a significant role as aggregation centre and service provider. In particular, we discuss a new infrastructure that will aggregate and make available plot-based vegetation data coming from existing databases and interact with the existing floristic resource.

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[2] Dpt. of Vegetal Ecology " Sapienza" University of Rome
[3] Dpt. of Life Sciences, University of Trieste
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The LifeWatch Italy Data Portal: from data sharing to analysis

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Biodiversity and ecosystem research is becoming central to major societal challenges as bioeconomy and climate action. To handle the scale and complexity of the scientific question being addressed, there is a strong need to integrate scientific knowledge. However, relevant data are heterogeneous, distributed and difficult to share. Initiatives to integrate data into viable resources for innovation in science and decision-making are being developed as local, regional, and global initiatives.
The Data Portal of the LifeWatch Italy (LW-ITA) e-infrastructure aims at facilitating data sharing and stimulating collaborative and data-intensive science in the fields of biodiversity and ecosystem research. LW-ITA Data Portal functionalities ease data management through the Data Life Cycle (quality assurance and quality control, metadata creation, integration, data discovery, visualization and analysis).
We present the currently available solutions for data management and sketch future developments. We aim to create a service-oriented e-infrastructure for biodiversity and ecosystem data, where all components are accessible through web services, in order to provide one single entry point to existing biodiversity and ecosystem data resources in Italy and to make them findable, accessible, interoperable and re-usable (FAIR principles) at all levels, from local to global.

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Communicating infrastructures: what biodiversity metadata tell us

Zilioli M.[1], **Oggioni A.[1, 3]** , Tagliolato P.[1, 3], Pugnetti A.[2], Carrara P.[1]

The conceptual framework of Essential Biodiversity Variables (EBVs) was proposed to structure biodiversity study globally, filling the gaps in biodiversity monitoring and ruling observations among different researchers. To organize raw data processing and accessibility with structural models, a workflow has been proposed to build data at global scale for species distribution and abundance by easing data integration from different providers. We present the case study of LTER-Italy sites to discuss their contributions in building EBV data basing our analysis on metadata compiled by the site managers. We conduct an interactive survey on site and dataset metadata hosted in the DEIMS-SDR , the LTER-Europe online metadata repository, and we present the potential of its metadata models not only to make data findable and understandable, but also to describe the EBV-related research activities at a network level. In particular, we classify the LTER-Italy sites according to two types contributions: the actual site contribution, based on DEIMS-SDR Data Set Metadata (EML), and the potential contribution, based on DEIMS-SDR Site Metadata (EMF). To assess the actual contribution, we verify if metadata are compliant in term of standards and correctly completed as required by the workflow, while to assess the potential contribution we consider the monitored EBVs documented by site managers. Through this approach, we document the EBVs coverage and bias of LTER-Italy, and discuss both the usefulness and the limits of metadata to enable an ICT platform in building EBVs data.

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Geo-referencing of biodiversity data in the LifeWatch Italy infrastructure: updates and perspectives

De Felici S.[1,3,4,] Oggioni A.[2,5], Fugazza C.[5], Cianferoni F.[1,6], **Tagliolato P.[2 5]**

The current availability of devices capable of associating geographical objects with their positions on Earth only partially solves the problems related to the location of biodiversity data and, in any case, does not concern the data produced up to a recent past.
The resolution of a toponym, that is the mapping process from a place name to its "spatial footprint", requires a procedure to convert a textual description of locality into a "formal" representation, expressed through coordinates and an adequate representation of uncertainty. At the heart of this process is the availability of a gazetteer, i.e. a controlled vocabulary of place names and related positions.
LifeWatch Italy has undertaken the preparation of a gazetteer with a semantic approach starting from the "Toponyms IGM" information layer made available by the Italian National Geoportal. Using the GeoNames ontology, the toponyms have been transformed into instances of geographical objects, their categorization mapped onto the GeoNames categories and relevant administrative entities linked to the related semantic resources featured by the ISPRA and ISTAT databases.
The first version of this semantic gazetteer has been updated, fixing several problems: attributes have been aligned, many geographical objects have been disambiguated and an empirical evaluation of the footprint of the objects is proposed. The new version of the gazetteer can be used as test for a (semi)automatic geo-referencing service for biodiversity data that can be made available to the users through the LifeWatch Service Centre.

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Share water sample metadata: an example from Sardinia LTER-Italy marine and freshwater sites

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A collection of phytoplankton fixed water samples has been maintained at the Department of Architecture, Design and Planning (DADU) of the University of Sassari, which is part of LifeWatch Italy (LW-ITA). The DADU collection includes samples from different aquatic ecosystems in Sardinia (freshwater, transitional and coastal marine), comprising research stations of sites "14 Sardinian marine ecosystems" and "10 Lake Ecosystems of Sardinia" of LTER-Italy (Long Term Ecological Research). The samples have been collected within different research projects since late 70s.

Scientific information available for each sample includes the list of phytoplankton species, their abundances and biovolume. This information has been reported on "raw counting tables". Furthermore, since the samples have been collected for ecological studies, each sample has been accompanied by data of sets of environmental variables, including measures obtained directly in the field and in the laboratory, reported on "sampling sheets" and "laboratory tables", partially already organized in electronic format.

A project funded by the Fondazione di Sardegna has allowed starting in cataloguing the phytoplankton samples, collecting and digitization of documents associated with them as well, with the general objective to valorise the ecological information present and linked to the samples. Nowadays, the use of innovative techniques (e.g. molecular techniques) can allow obtain more information on biodiversity also from old samples. Consequently, the DADU collection represents a potential source of biodiversity information. A process of sharing, by the use of CSIRO physical samples metadata model according with International Geo Sample Number (IGSN), gathered in the project has been started.

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Project Dryades: 15 years of biodiversity informatics

Martellos S., Nimis P. L.

Project Dryades was born in 2003, when the University of Trieste published online the first version of ITALIC, the information system on Italian lichens (http://dryades.units.it/italic). The development of this resource required the acquisition of skills in the domain of Biodiversity Informatics, i.e. the application of informatics techniques to biodiversity data for improved management, presentation, discovery, exploration and analysis. In the following years, Dryades has developed several other tools and resources available online. One of the most relevant is FRIDA (FRiendly IDentificAtion), a tool for the generation of interactive digital identification keys, which brought to the online publication of more than 600 digital keys to several groups of organisms, many of which are also available in a stand-alone version for tablets and smartphones thanks to the free app KeyToNature. Other resources include checklists (to the vascular flora, lichens, mosses, liverworts, and macrobasidiomycetes of Italy), portals to the biodiversity of several areas in Italy and other countries, consistent image archives for several groups of organisms, morpho-anatomical databases, etc. All of these resources, which are linked together in an unique system, are available online on the portal of the project (http://dryades.units.it).

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An innovative PaaS solution to support Big Data Analytics and Workflow management via Galaxy

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The Galaxy as a Cloud Service" platform provides the possibility to automate the creation of Galaxy-based virtualized environments through an easy setup procedure, providing an on-demand workspace ready to be used by life scientists and bioinformaticians who require a powerful computational infrastructure to run complex analyses over large datasets within the familiar Galaxy environment. The service leverages the technologies developed within the H2020 INDIGO-DataCloud project, which aimed at developing cloud solutions for e-science, allowing to setup and launch a virtual machine configured with the needed auxiliary applications, such as Postgresql, Nginx, Uwsgi and Proftpd, and to deploy the Galaxy platform itself. Moreover, each Galaxy instance is customizable selecting different sets of pre-installed tools and comes with reference data already available, shared among all the instances. Finally, the service can instantiate Galaxy with SLURM as Resource Manager with automatic elasticity support, deploying and powering on and off new working nodes when needed, depending on the workload of the cluster, producing an efficient use of the resources. We will also present the evolution coming from the development planned within the DEEP-HybridDataCloud H2020 project, that will enable the possibility to exploit hybrid cloud environment and specialized hardware (like GPUs, etc). This project will provide small research groups, institutions and SMEs with a simple solution allowing them to setup and use their own Galaxy instance on suitable computational resources, removing or mitigating the burden of maintaining a hardware and software infrastructure."

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Opportunities and challenges of Virtual Research Environments for biodiversity study

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LifeWatch aims to develop Virtual Research Environments (VRE) for the study of biodiversity patterns and processes. The VRE should provide access to ICT services, data, software components but also provides a collaborative working environment where researchers can cooperate during all the research lifecycle. In the last years many VRE prototypes have been developed by different initiatives, providing an overview on advantages and disadvantages of different architectures.

LifeWatch-Italy, within the framework of the alien species show case, explored the possibility to develop a workflow-oriented VRE, where researchers could harvest data from the LifeWatch dataportal and analyze them using modules embedding R script or calling external web services. A prototype of the workflow-oriented VRE (AS-VRE) has been made accessible through the LifeWatch service centre portal. In the AS-VRE researchers can replicate the statistical analyses employed in the alien species show case by using the Taverna software, a tool developed to orchestrate scientific workflows, that allows to connect tools, scripts and web services.

A workflow-oriented VRE clearly can provide high flexibility, especially in term of the potential use of web services. However, this comes at the cost of a lower usability due to the complexity of orchestrating software that requires a minimum level of informatics skills, often lacking to researchers. Following a strategy proposed to overcome some usability issues, specific components have been developed to ease user interaction with the workflow execution. The AS-VRE currently allows researchers to produce a small bunch of analyses and represents a valuable starting point to think over VRE architectures and to build up a virtual research environment that will fit with important pillars such as usability, analytical power, easy access to data and software and cooperation improvement.

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Assessing habitats vulnerability - a macroecological approach within the LifeWatch Italy "Alien Species Show Case"

Pierri C.[1,2], Colangelo P.[1,2], Bergami C.[1,5], Balech B.[1,3], Cianferoni F.[1,2], De Felici S.[1,2], Fiore N.[1,6], Oggioni A.[1,7], Tagliolato P.[1,7], Rosati I.[1,2], Boggero A.[1,4]

Environmental Science is undergoing a period of big changes facing the challenge of data collection in an era driven by data. A big amount of data is pivotal when upscaling the study of ecological processes to the macro-ecological level, investigating multiple species distributed in multiple habitats. LifeWatch (LW), the European e-Science infrastructure on biodiversity and ecosystems, aims to strength the scientific research on biodiversity through the sharing biodiversity data making them Findable, Accessible, Interoperable and Reusable. According to this scenario, the LW Mediterranean Thematic Centre (MTC), together with the other TCs and the ICT members, developed a first case study collecting biodiversity data to investigate the vulnerability of ecosystems to biological invasions. The main scope of the Alien Species Show Case was assessing fragility of EUNIS habitat types to alien and invasive species and modelling their fragility to abiotic forcing. Occurrence records were gathered from specific datasets belonging to more than 30 public and private research institution. Overall a dataset on the occurrence of more than 12000 species from 560 sites (lagoon, marine, freshwater and terrestrial) across the Italian peninsula, was gathered. Records were organized and enriched with additional information to be useful to the further analysis. The data validation has been made through the data cleaning semi-automatic service in the LW dataportal, based on the lifewatch-ita Global Name Architecture, which refers to PESI, Worms, and COL. Here we report the steps that led to the show case development and the related results obtained, in terms of published scientific papers.

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EVER-EST: a VRE for the Earth Science Community

Marelli F.[1], Foglini F.[2], Albani M., Leone R.

EVER-EST is an H2020 initiative developing a VRE framework based on advanced services to support each phase of the Earth Science Research and Information Lifecycle. The project follows a user-centric approach which have produced a wealth of innovative and state-of-the-art technologies, systems and tools for e-collaboration, e-learning, e- research and long term data preservation. It provides innovative services to Earth Science user communities for the generation, communication, cross-validation and sharing of knowledge and science outputs. The EVER-EST e-infrastructure is validated by four virtual research communities (VRC) covering different multidisciplinary Earth Science domains including: ocean monitoring, natural hazards, land monitoring and risk management (volcanoes and seismicity). Each VRC uses the virtual research environment according to its own specific requirements for data, software, best practice and community engagement. This user-centric approach will allow an assessment to be made of the capability for the proposed solution to satisfy the heterogeneous needs of a variety of Earth Science communities for more effective collaboration, greater efficiency and innovative research. Central to the EVEREST approach is the concept of the Research Object (RO), which provides a semantically rich mechanism to aggregate related resources about a scientific investigation so that they can be shared together using a single unique identifier. Although several e-laboratories are incorporating the research object concept in their infrastructure, the EVER-EST VRE will be the first infrastructure to leverage the concept of Research Objects and their application in observational rather than experimental disciplines.

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[2]National Research Council (CNR), Institute of Marine Sciences (CNR-ISMAR)
[3] European Space Agency

Processing of occurrence biodiversity datasets to be distributed in the European infrastructures EMODnet Biology and SeaDataCloud

Eliezer M., Lipizer M., Cataletto B., Giorgetti A.

OGS is recognised as the Italian National Oceanographic Data Centre (OGS-NODC) within the International Oceanographic Data Exchange (IODE) System. Since 2013, OGS-NODC has extended the range of parameters managed, including also marine biodiversity data. The management of biodiversity requires specific Quality Control (QC) procedures developed for taxonomic data. The activity presented will range from QC to DOI minting for a standard format dataset archived by the Italian NODC. Java programming has been used to convert original datasets to standard formats adopted by large communities, such as Darwin-Core archives, published by GBIF IPT software and used by EMODnet Biology, and SeaDataCloud biological variant of Ocean Data View (ODV) format. Metadata are described using controlled vocabularies maintained by the British Oceanographic Data Centre. A large effort is dedicated to gather very detailed information, which are required by users to compare or to aggregate datasets from different sources. The long-term availability of the data is guaranteed also by the clouds of two big European repositories. Data users can find the processed datasets in different standard formats and using different web services and data access portals, including also OBIS portal. A case study of a biodiversity data product developed in the framework of EMODnet Biology will be presented, based on data from the Long Term Ecosystem Research (LTER) site in the North Adriatic. The LTER North Adriatic plankton series data product is a web application written in R programming language, based on data from LTER-C1 station, in the Gulf of Trieste.

National Institute of Oceanography and Applied Geophysics (OGS)

ECOFAHRE (ECOsystem Functional Attributes High Resolution Estimator) service

Vicario S.[1], Adamo M.[1], Tarantino C.[1], Regos A.[2], Blonda P.[1]

Plant primary productivity is an essential variable both for biodiversity (as driver of ecosystem carrying capacity) and climate (both as driver of evapotranspiration and directly involved in carbon fixation). In situ measurements of Gross Primary Productivity (GPP) require large and costly infrastructures to estimate CO2 fluxes from eddy covariance estimates of net ecosystem exchange and respiration. Satellite medium resolution data (e.g. MODIS) are typically used to obtain global estimates of green FAPAR (the main component of GPP) at 300-m resolution. This resolution is problematic especially for biodiversity management at local scales, where it is important to appreciate habitat heterogeneity, especially in patchy environments as mountain and Mediterranean habitats.
We set up an approach to estimate Ecosystem Functional Attributes/Types sensu Alcaraz et al. 2006, that are 3 features (mean, coefficient of variation, peak's day of the year) of the GPP seasonal dynamics plus the yearly anomalies. For this, we used atmospherically corrected Landsat time series at 30 m resolution. We tested the approach over a cloudy mountain region – the Peneda-Gerês National Park (Portugal). To correctly extract features across missing and low-quality data pixels, we used a harmonic model linearly fitted over each pixel time series. Over 12 vegetation indices, MSAVI followed by SAVI and EVI, showed the best fit over the data. With MSAVI-based model, 98% of pixels showed a significant model fit ($p = 0.01$) and 90% of them an explained variance higher that 58%. The model was implemented using open source python library and will be soon released within the VirtualLab implemented within the Ecopotential H2020 project.

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The ECOPOTENTIAL Virtual Laboratory

Mazzetti P.[1], **Santoro M.**[1], Lucas R.[2], Blonda P.[1], Nativi S.[1,3]

The ECOPOTENTIAL project, funded under the Horizon 2020 programme aims at building a unified framework for ecosystem studies and management of protected areas. To achieve such objective, open and interoperable access to data and knowledge is assured by the GEO Ecosystem Virtual Laboratory Platform (ECOPOTENTIAL VLab) which aims at supporting the ecosystem community-of-practice in research activities for informed decision-making in ecosystem management.

The ECOPOTENTIAL VLab provides multiple entry points to access information at different semantic level depending on the user's specific interest, ranging from ecosystems, protected areas, storylines, workflows (e.g. business processes necessary for storylines), algorithms and data. In particular, users have access to in-situ data and raw and pre-processed remote-sensing data (e.g. Sentinel 1/2 and Landsat).

Users can access and run workflows represented as BPMN diagrams and available as source code in repositories like GitHub or as remote processing services. Several ecosystem models are under porting in the ECOPOTENTIAL VLab. In particular, the Earth Observation Data for Ecosystem Monitoring (EODESM) model is already available for running on most of the ECOPOTENTIAL Protected Areas. EODESM classifies land covers according to the FAO Land Cover Classification System (LCCS2) taxonomy.

The ECOPOTENTIAL VLab is designed to be fully interoperable with the GEOSS Platform, allowing the discovery and access of data from GEOSS and the publication of model outputs. A prototype of a GEOSS Community Portal for the ECOPOTENTIAL community has been developed in collaboration with ESA.

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ECOPOTENTIAL: Using Earth Observation to Protect Natural Ecosystems

Provenzale A.[1], Giamberini MS.[1], Marangi C.[2], Blonda P.[3]

Space exploration is revealing the abundance of other solar systems, but at the same time is showing the uniqueness of our Planet. Using sophisticated Earth Observation technologies such as the European "Sentinels", belonging to the greatest Earth Observation programme ever realised, Copernicus, we are now getting plenty of information at unprecedented high spatial and temporal resolution.

Novel approaches for blending most advanced technologies with field work and conservation issues aimed at understanding and modelling status and changes of ecosystems are at the heart of ECOPOTENTIAL, a large European H2020 project with 47 partners, running from 2015 to 2019. ECOPOTENTIAL works on 25 protected areas (PAs) in Europe and beyond, spanning all biogeographical regions of Europe and focusing on mountain, arid and semiarid, coastal and marine environments, adopting the view of ecosystems as "one physical system with their environment, characterized by strong interactions between geosphere and biosphere across multiple scales.

ECOPOTENTIAL has strong links with other international research programmes, such as GEO ECO, eLTER, GEO BON and LifeWatch. In particular, all data, models and knowledge will be available on common and open platforms through a virtual laboratory contributing to the GEOSS, the Common Infrastructure of the Group on Earth Observation, an international organisation linking more than 100 countries and 100 institutions, aimed to share and make openly available Earth Observation data, and including also a wide programme for building a community of practice through seminars, training, citizen science actions and outreach.

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Session ICT Services
Poster Presentations

Interactive acoustic classification and the foundation of a knowledge base for the Mediterranean environment

Giacoma C.[1], Gamba M.[1], Rolando A.[1], Palestrini C.[1], Friard O.[1], Mazzola S.[2], Buscaino G.[2], Papale E.[2], Pavan G.[3], Fiore N.[4], Basset A.[4]

In latest years, there is an increased interest in automatic recognition systems for animal acoustic emissions. A new stream of software tools indicated that an integrated approach to bioacoustics is a crucial element to improve knowledge starting from the scientific expertise and citizen science. This opportunity has an added value in the chance to involve people in the discovery and valorisation of the Mediterranean environment and of its acoustic expression (soundscape). It is necessary to develop a system for the recognition of biologic acoustic signals through spectral signatures. The software will allow associating metadata (e.g., GPS information), sounds and spectral fingerprints in the database, as well as it has to guarantee the interoperability of the metadata. It will be a complex system for the automatic classification of marine and terrestrial species by their time-spectral fingerprints. The system will integrate a multifaceted analytical system of the acoustic signal devoted to the extraction of robust time-spectral features. The system will implement the main technologies currently on the market, in term of solution related to web interaction, big data mining, machine learning, to integrate the results from these analyses using innovative data mining architectures. Species identification will be performed using acoustic fingerprints, which is the generation of acoustic spectra that will be compared with those generated from the sounds of the knowledge base. This process will lead to the probabilistic classification of a sound to a species level. The asset in question will have its crucial elements in: an environment to integrate data segmentation and classification based on the combination of experts and unsupervised methods; a machine learning engine; a knowledge base repository. The system will support research, data dissemination, education, and conservation.

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Session Citizen Science, Communication of Science & Training

Oral Presentations

City Nature Challenge: an effective Citizen Science approach for monitoring urban biodiversity

Cambria V. E.[1], Buffi F.[2], Attorre F.[2], De Sanctis M.[2], Fanelli G.[2], Massimi M.[2], Testolin R.[2], Del Vico E.[2], Sitzia T.[1], Campagnaro T.[1], Perfetti M.[1], Semenzato P.[1], Rizzi A.[1], Michielon B.[1], Iacopino S.[1], Piazzi C.[1], Quetri T.[1], Pirovano C.[3], Rossi K.[3], Cesaroni D.[4], Sbordoni V.[4], De Felici S.[5], Trimani G.[6], Chiancone E.[6], Luise D.[7], Rinzafri C.[7], Minicuci M.[7], Martellos S.[8]

City Nature Challenge is an international citizen science initiative, promoted by the Natural History Museum of Los Angeles County and the California Academy of Sciences. The challenge, which aims at increasing the knowledge of urban nature through public participation, involves cities from several countries. It's a bioblitz-style competition, where cities challenge each other in gathering the highest number of observations, finding the highest number of different taxa, and engaging the highest number of citizens. As a result of the successful 2017 edition of City Nature Challenge (> 4000 people involved across 16 US cities; >125,000 observations; >8600 species) the event has gone global. In 2018, 68 cities all over the world were involved in a 4-days competition in which over 17,000 citizens have collected more than 440,000 observations of 18,000 taxa. Rome and Padua were the two Italian cities taking part in the contest. The participants used two mobile applications, "CSMON-LIFE" and "iNaturalist". More than 250 Italian citizens collected 1,700 observations of more than 500 taxa. Data have been validated and are now feeding national (Italian Network of Biodiversity) and international (Global Biodiversity Information Facility) aggregators of primary biodiversity data. These data will be used to investigate environmental issues such as: biodiversity impact due to the presence of invasive alien species; effects of climate change; conservation of rare species; human effects on environment. The success of this global citizen science initiative paved the way for defining new strategies in biodiversity data collection to support the development of international research infrastructures, such as LifeWatch.

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[6] National Accademy of Sciences called of the XL
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Natural history forums as source of valuable biodiversity data

De Felici, S.[1, 2, 3], Mazzei P.[4], Dinolfo T.[4], Gioli F.[4], Labriola C.[4], Sbordoni V.[3-5], Cesaroni D.[3]

One of the most interesting developments in the impact of Internet on the environmental sciences is the increasing involvement of non-scientists in scientific projects. Among the scientific activities so far less investigated there are the natural history forums, where users exchange knowledge and opinions by sending photos and messages. Forums dedicated to discussions on the natural sciences usually do not represent and do not carry out any project, including those of Citizen Science but, over the years, have accumulated large amounts of data on flora and fauna that could be important and constantly updated sources of primary biodiversity data. To test the suitability of these data we analyzed the threads about butterflies from two of the most preeminent Italian natural history forums: Natura Mediterraneo (FNM) and Forum Entomologi Italiani (FEI). For more than 4,000 observations we assessed the matching level between the identifications in the forums and ours own and the degree of accuracy of spatial description was evaluated too.

According to the results, the observations from the examined forums can be considered useful sources of biodiversity data both from the reliability of identifications and from spatial precision. Further tests are under way on different taxonomic groups that may present different problems both for identifications from images and for the accuracy of geographical references. We suggest that massive data recovery from forums through the automatic interpretation of forum threads should be carefully evaluated.

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Online competition and serious games to stimulate students' interest on ecological issues

Sangiorgio F., Calcagnile D., Gjoni V., Cozzoli F., Fiore N., Basset A.

Today science and technology provide the basis for the fundamental advances in education. In the new educational environment of the "distance education", Information and Communications Technology (ICT) represent one of the main tools to teach and learn. Here, we propose a national online competition and some European serious games on Ecology and Earth sciences for students of intermediate and high school. The aim of the initiatives is to stimulate the interest of young people about ecosystems that provide our society with goods and services. Moreover, we try to awake young people and public opinion to problems regarding the health of our biosphere. Climate changes, biodiversity, ecosystem goods and services, sustainability, Marine Strategy Framework Directive are some of the ecological subjects of interest of our games; moreover the scientific method applied to natural sciences is the focus of the games. Excellent results were obtained in terms of number of schools participating to the initiatives; moreover, they found a high enthusiasm of students and teachers both on national and European scale.

University of Salento

CITIZEN SCIENCE OSSERVATORIO - an active Italian Citizen Science Centre

Gumiero B.[1,2], **Di Grazia F.[2,3]** , Tassi F.[1]

Citizen Science Osservatorio (CSO) supported by CIFLA - Fondazione Flaminia, located in Ravenna (Italy) is a new Italian centre built to manage and promote citizen science projects. The main objectives are to involve people and promote a sense of belonging to a research group, as well as bringing citizens closer to environmental issues by establishing a dialogue between local stakeholders. Together we try to solve conflict situations between man and nature, by a process of empowerment and awareness focusing on environmental conservation and restoration. CSO places itself as a hub of an Italian-global citizen science network sharing best practices and supporting environmental sustainable management. One of our main challenge is to work at local level by creating direct relationships with citizens and being integrated into a global network at the same time. Therefore, on the one hand, we support every citizen science activity locally, and on the other we provide our scientific skills for the citizen science network like freshwater ecology and riparian vegetation monitoring. In order to achieve this, we aim to disseminate good practice for data collection and develop new applications and methodologies as required in response to citizen needs or technological advance by research activities.

Currently we are working on: FreshWater Watch programme (e.g.: Ravenna WaterBlitz), development of a photogrammetric user friendly App to implement monitoring for conservation purposes, development of a user friendly App to monitoring the riparian vegetation, and the "Mini Sass" project for aquatic macroinvertebrate monitoring within school projects.

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Influence of citizen science tools in the monitoring of marine alien species

Trevisi R.*, Petruzzella D., Scorrano S. (*Oral communication presented by Gaetano Ladisa)

CSMON-LIFE project (2014-2017) aimed at new approaches to involve citizens in expanding and improving scientific knowledge on management and biodiversity protection. A project task was dedicated to marine alien species recorded along the Italian coasts (especially Adriatic and Ionian basin).
The free CSMON-app was designed to receive "alerts" by fishermen, divers and the general public.

At the beginning, critical issues related to the use of the app were noticed, due to stakeholders low technology mastery, also confirmed by the low number of alerts received. In order to achieve a wider response, it has been decided to integrate less innovative and technological tools that certainly reached the stakeholders while maintaining the minimum information characteristics (photo, date and location) such as e-mail, Facebook and WhatsApp. These tools, together with the app, gave the possibility to receive a higher response (153 alerts were collected and analyzed). Besides, communication and dissemination activities were organized (meetings and seminars, social media, articles on local and national journals and newspapers).

The preliminary results demonstrate (i) the need to set the alerts collection tools according to the target groups, (ii) the lack of knowledge about marine alien species, often confused with the common/rare ones and (iii) the potentiality of the Mediterranean area as sink (and source) for the biological invasions.

Long-term investigations coupled with the awareness of the role played by the citizen scientists will improve the knowledge of marine alien species, representing the first early warning system for the detection of new arrivals.

CIHEAM Bari

"OCCHIO ALLE PENNE": a crowdsourcing collection digitization experiment

De Felici S.[1, 2, 3], Marangoni C.[4], Pinzari M.[5], Riccarducci G.[5], Colosimo G.[5], Merzagora L.[6]

Crowdsourcing is an innovative sourcing model through which individuals or organizations seek the help of Internet-users to achieve a specific goal. This approach is based on the mutually beneficial interaction between partners. The digitization of historical collections is an essential step in fulfilling a natural history museum mission of the 21st century, but it requires great efforts and resources. High School and college students, amateur naturalists and museum scientists represent the ideal "crowd" for the digitization of natural history collections: scientists can gather data otherwise difficult to obtain and internet-users directly participate in a scientific endeavor and acquire new skills through the interaction with professional scientists. In the framework of the project "Creativi per Natura" promoted by RESINA (the system of Natural History Museums of Regione Lazio) and granted by Regione Lazio, we started a pilot activity named "OCCHIO ALLE PENNE" to test the crowdsourcing approach in a school context. The goal was the digitization of the specimen labels from one of the historical ornithological collections in the Civic Museum of Zoology (MCZR) of Rome. The birds were photographed by museum scientists at MCZR and pilot digitization was implemented by NatureLab Association using the online platform Zooniverse". About a hundred students from four high schools were involved throughout the activity. The project has been completed in less of six months.

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Enjoying nature in mountain national parks getting people's perspectives on cultural ecosystem services

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"Combining management objectives in protected areas requires accounting for the preservation of nature and for the on-going development of outdoor activities. Within the H2020 ECOPOTENTIAL project (www.ecopotential-project.eu/), our objective is to characterize the actual uses and benefits of cultural ecosystem services. We will develop citizen science activities in summer 2018, in three European mountain national parks, in order to characterize which locations are attracting visitors and how natural features are driving frequentation. Combining participatory mapping (including use of a smartphone app) with field questionnaires, we will in particular produce a human preference map for cultural ecosystem services. Our Ecopotential activities also target the development of a guide on how to implement citizen science for environmental monitoring in protected areas, to which several protected area managers and researchers contributed during a workshop held in Roma (Italy), in November 2017.

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A Virtual Museum on Ecosystems

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Space exploration is revealing the abundance of other solar systems, but at the same time is showing the uniqueness of our Planet. Using sophisticated Earth Observation technologies such as the European "Sentinels", belonging to the greatest Earth Observation programme ever realised, Copernicus, we are now getting plenty of information at unprecedented high spatial and temporal resolution.

Novel approaches for blending most advanced technologies with field work and conservation issues aimed at understanding and modelling status and changes of ecosystems are at the heart of ECOPOTENTIAL, a large European H2020 project with 47 partners, running from 2015 to 2019. ECOPOTENTIAL works on 25 protected areas (PAs) in Europe and beyond, spanning all biogeographical regions of Europe and focusing on mountain, arid and semiarid, coastal and marine environments, adopting the view of ecosystems as "one physical system with their environment, characterized by strong interactions between geosphere and biosphere across multiple scales.

ECOPOTENTIAL has strong links with other international research programmes, such as GEO ECO, eLTER, GEO BON and LifeWatch. In particular, all data, models and knowledge will be available on common and open platforms through a virtual laboratory contributing to the GEOSS, the Common Infrastructure of the Group on Earth Observation, an international organisation linking more than 100 countries and 100 institutions, aimed to share and make openly available Earth Observation data, and including also a wide programme for building a community of practice through seminars, training, citizen science actions and outreach.

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